

Unit 1 Day 4

Section 1.6

Rational Exponents

Definitions and Rules for Exponents

Let r and s be rational numbers. The results here are valid for all positive numbers a and b .

$$a^r \cdot a^s = a^{r+s}$$

$$(ab)^r = a^r \cdot b^r$$

$$(a^r)^s = a^{rs}$$

$$\frac{a^r}{a^s} = a^{r-s}$$

$$\left(\frac{a}{b}\right)^r = \frac{a^r}{b^r}$$

$$a^{-r} = \frac{1}{a^r}$$

$$a^0 = 1$$

Rational Exponent

For all integers m , all positive integers n , and all real numbers a for which $a^{1/n}$ is a real number:

$$a^{m/n} = \left(a^{1/n}\right)^m .$$

Perform each operation mentally.

$$\begin{aligned} 1) \quad \frac{3.3^3}{1.1^3} &= \left(\frac{3.3}{1.1} \right)^3 \\ &= 3^3 \\ &= \boxed{27} \end{aligned}$$

$$\begin{aligned} 2) \quad (.25^2)(44^2) &= \\ &= [(.25)(44)]^2 \\ &= 11^2 \\ &= 121 \end{aligned}$$

If $(x^2)^3 = (20)^3$, what is x^6 ?

$$x^6 = 20^3$$

$$x^6 = 8000$$

Simplify using the rules of exponents (only positive exponents)

1) $\left(x^{\frac{3}{2}}y^{\frac{1}{5}}\right)^{10}$

$x^{\frac{3}{2} \cdot 10} y^{\frac{1}{5} \cdot 10}$

$x^5 y^2$

2) $(y^{z+2})^4$

$y^{4(z+2)}$

y^{4z+8}

$$3) \frac{(x-1)^5}{(x-1)^3}$$

$$(x-1)^2$$

$$4) \left(\frac{4xy^5z^2}{x^{-2}yz^3} \right)^{\frac{1}{2}}$$

$$\left(\frac{4x^3y^4}{z} \right)^{\frac{1}{2}}$$

$$\frac{4^{\frac{1}{2}} x^{\frac{3}{2}} y^{\frac{4}{2}}}{z^{\frac{1}{2}}} = \frac{2x^{\frac{3}{2}} y^2}{z^{\frac{1}{2}}}$$

$$5) \quad \frac{2^{\frac{1}{4}} \cdot 2^{\frac{5}{4}}}{2^4} = \frac{2^{\frac{6}{4}}}{2^4}$$

$$= \frac{2^{3/2}}{2^4} = \frac{1}{2^{5/2}}$$

$$\frac{3}{2} - 4 = \frac{3}{2} - \frac{8}{2} = \frac{5}{2}$$
~~$$\frac{2}{5} \cdot \frac{3}{5} = \frac{6}{25}$$~~

$$6) \quad \frac{(x^3)^{y+2}}{2x^y} \quad \text{where } y < -3$$

$$\frac{x^{3y+6}}{2x^y} = \frac{x^{3y+6-y}}{2}$$

$$= \frac{x^{2y+6}}{2} = \frac{1}{2x^{-(2y+6)}}$$

$$\left[\frac{1}{2x^{-2y-6}} \right]$$

7) $\frac{(x^3)^{y+2}}{2x^y}$ where $y > 0$

$$\frac{x^{3y+6}}{2x^y} = \frac{x^{2y+6}}{2}$$

8) $\left(\frac{x^{14}(x^5)^{-9}}{(2x^7)^2} \right)^{-\frac{1}{7}} =$

$$\left(\frac{x^{14}x^{-45}}{4x^{14}} \right)^{-\frac{1}{7}} = \left(\frac{x^{-31}}{4x^{14}} \right)^{-\frac{1}{7}}$$

$$\left(\frac{1}{4x^{45}} \right)^{-\frac{1}{7}} = (4x^{45})^{\frac{1}{7}}$$

$$4^{\frac{1}{7}} x^{\frac{45}{7}}$$

9)

$$\frac{(3m^3)^2(mn)^{-1}}{(25m^{14}n^{-4})^{\frac{1}{2}}} =$$

10)

$$\left[\left(\frac{1}{4} x^{-4} y \right)^{-2} \left(-\frac{1}{2} xy^5 \right)^2 \right]^3 =$$

Homework:

Day 4 Assignments

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